



## INDEX BY SUBJECT

- . Algebra
- Applied Mathematics
- Calculus and Analysis
- Discrete Mathematics
- > Foundations of Mothematics
- o Geometry
- History and Terminology
- Number Theory
- Probability and Statistics
- Recreational Mathematics
- Topology

ALPHABETICAL INDEX ()

- ABOUT THIS SITE
- AUTHOR'S NOTE
- **₩HAT'S HEW**
- → RANDOM ENTRY **₩ BE A CONTRIBUTOR**
- SIGN THE GUESTBOOK
- O EMAIL COMMENTS
- HOW CAN I HELP?
- > TERMS OF USE

ERIC'S OTHER SITES &

ORDER BOOK FROM AMAZON COM

Calculus and Analysis > Differential Geometry > Differential Geometry of Curves •

## Radius of Curvature

The radius of curvature is given by

$$R \equiv \frac{1}{\kappa},\tag{1}$$

where  $\kappa$  is the <u>curvature</u>. At a given point on a curve, R is the radius of the osculating circle. The symbol  $\rho$  is sometimes used instead of R to denote the radius of curvature.

Let x and y be given parametrically by

$$x = x(t) (2)$$

$$y = y(t), (3)$$

then

$$R = \frac{(x'^2 + y'^2)^{3/2}}{x'y'' - y'x''},\tag{4}$$

where x' = dx/dt and y' = dy/dt. Similarly, if the curve is written in the form y = f(x), then the radius of curvature is given by

$$R = \frac{\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{3/2}}{\frac{d^2y}{dx}}.$$
 (5)

In polar coordinates  $r = r(\theta)$ , the radius of curvature is given by

$$R = \frac{(r^2 + r_{\theta}^2)^{3/2}}{r^2 + 2r_{\theta}^2 - rr_{\theta\theta}},\tag{6}$$

where  $r_{\theta} = dr/d\theta$  (Gray 1997, p. 89).

Bend, Curvature, Osculating Circle, Radius of Gyration, Radius of Torsion, **Torsion** 

## References

Gray, A. Modern Differential Geometry of Curves and Surfaces with Mathematica, 2nd ed. Boca